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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
WALLING, MEAGAN S	

ART UNIT	PAPER NUMBER
2863	

DATE MAILED: 02/18/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/090,584	RYSKOSKI, MATTHEW S.	
	Examiner	Art Unit	
	Meagan S Walling	2863	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04 March 2002*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-33* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-33* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *03/04/02* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

1. Claims 1-5, 7, 9-10, 12-13, 15-21, 23, 25-26, 28-29, and 31-33 are rejected under 35 U.S.C. 102(e) as being anticipated by Sonderman et al. (US 6,650,955).

Regarding claim 1, Sonderman et al. teaches processing a workpiece in a process flow (column 2, lines 39-40); collecting workpiece state trace data for the workpiece during its processing in the process flow (column 4, lines 47-49); and generating a quality profile of the workpiece based on the workpiece state trace data (column 6, lines 7-10).

Regarding claim 2, Sonderman et al. teaches that collecting the workpiece state trace data further comprises collecting metrology data associated with the workpiece (column 2, lines 40-42).

Regarding claim 3, Sonderman et al. teaches that the workpiece comprises a semiconductor device (column 1, lines 9-10), and collecting the metrology data further comprises measuring at least one of a transistor gate critical dimension, a process layer thickness, a particle contamination count, and a transistor active region dimension (column 5, lines 1-5).

Regarding claim 4, Sonderman et al. teaches that the workpiece comprises a semiconductor device (column 1, lines 9-10), and collecting metrology data further comprises

measuring at least one of a transistor effective channel length, a drive current, an insulating layer dielectric constant, a transistor overlap capacitance, a regional material resistivity, a transistor threshold voltage, an n-channel to p-channel drive current ration, an off-state transistor leakage current, and electrical charge carrier mobility measurement, and an oscillator test circuit frequency (column 5, lines 1-5).

Regarding claim 5, Sonderman et al. teaches that collecting the workpiece state trace data further comprises collecting defect data associated with the workpiece (column 5, lines 4-5).

Regarding claim 7, Sonderman et al. teaches that collecting workpiece state trace data further comprises collecting process data associated with the processing of the workpiece in the process flow (column 2, lines 42-46).

Regarding claim 9, Sonderman et al. teaches generating at least one quality characteristic metric associated with the workpiece (column 5, lines 4-5).

Regarding claim 10, Sonderman et al. teaches generating at least one of a yield characteristic metric, a grade characteristic metric, a power consumption metric, a film resistivity metric, a film capacitance metric, a defect density metric, and a feature dimension metric (column 5, lines 4-5).

Regarding claim 12, Sonderman et al. teaches determining the quality characteristic based on the collected workpiece state trace data (column 4, lines 47-49) and an empirical model (column 6, lines 1-3).

Regarding claim 13, Sonderman et al. teaches comparing the collected workpiece state trace data to a library of reference workpiece state traces, each reference workpiece state trace having an associated quality characteristic (column 5, lines 33-35); selecting a reference

workpiece state trace closest to the collected workpiece state trace data; and selecting the quality characteristic metric associated with the selected reference workpiece state trace (column 5, lines 36-37).

Regarding claim 15, Sonderman et al. teaches processing a semiconductor device (column 1, lines 9-10).

Regarding claim 16, Sonderman et al. teaches processing at least one of a microprocessor, a memory device, a digital signal processor, and an application specific integrated circuit (column 1, lines 17-18).

Regarding claim 17, Sonderman et al. teaches a plurality of tools configured to process a workpiece in a process flow (column 2, lines 39-46); a quality monitor configured to collect workpiece state trace data for the workpiece during its processing in the process flow to generate a quality profile of the workpiece based on the workpiece state trace data (column 2, lines 46-48 and column 6, lines 7-10).

Regarding claim 18, Sonderman et al. teaches metrology data associated with the workpiece (column 2, lines 40-42).

Regarding claim 19, Sonderman et al. teaches that the workpiece comprises a semiconductor device (column 1, lines 9-10), and the metrology data further comprises measuring at least one of a transistor gate critical dimension, a process layer thickness, a particle contamination count, and a transistor active region dimension (column 5, lines 1-5).

Regarding claim 20, Sonderman et al. teaches that the workpiece comprises a semiconductor device (column 1, lines 9-10), and the metrology data further comprises measuring at least one of a transistor effective channel length, a drive current, an insulating layer

dielectric constant, a transistor overlap capacitance, a regional material resistivity, a transistor threshold voltage, an n-channel to p-channel drive current ration, an off-state transistor leakage current, and electrical charge carrier mobility measurement, and an oscillator test circuit frequency (column 5, lines 1-5).

Regarding claim 21, Sonderman et al. teaches that the workpiece state trace data further comprises collecting defect data associated with the workpiece (column 5, lines 4-5).

Regarding claim 23, Sonderman et al. teaches that the workpiece state trace data further comprises process data associated with the processing of the workpiece in the process flow (column 2, lines 42-46).

Regarding claim 25, Sonderman et al. teaches at least one quality characteristic metric associated with the workpiece (column 5, lines 4-5).

Regarding claim 26, Sonderman et al. teaches at least one of a yield characteristic metric, a grade characteristic metric, a power consumption metric, a film resistivity metric, a film capacitance metric, a defect density metric, and a feature dimension metric (column 5, lines 4-5).

Regarding claim 28, Sonderman et al. teaches determining the quality characteristic based on the collected workpiece state trace data (column 4, lines 47-49) and an empirical model (column 6, lines 1-3).

Regarding claim 29, Sonderman et al. teaches comparing the collected workpiece state trace data to a library of reference workpiece state traces, each reference workpiece state trace having an associated quality characteristic (column 5, lines 33-35); selecting a reference workpiece state trace closest to the collected workpiece state trace data; and selecting the quality

characteristic metric associated with the selected reference workpiece state trace (column 5, lines 36-37).

Regarding claim 31, Sonderman et al. teaches a semiconductor device (column 1, lines 9-10).

Regarding claim 32, Sonderman et al. teaches at least one of a microprocessor, a memory device, a digital signal processor, and an application specific integrated circuit (column 1, lines 17-18).

Regarding claim 33, Sonderman et al. teaches means for processing a workpiece in a process flow (column 2, lines 39-40); means for collecting workpiece state trace data for the workpiece during its processing in the process flow (column 2, lines 42-46); and means for generating a quality profile of the workpiece based on the workpiece state trace data (column 6, lines 7-10).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 6 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sonderman et al. in view of Lin et al. (US 6,292,582).

Sonderman et al. teaches all of the limitations of claims 6 and 22 except the limitation of identifying at least one of a missing pattern defect, a particle contamination defect, and an electrical arc damage defect.

Lin et al. teaches identifying a missing pattern defect (see Fig. 24b, Ref. 382).

It would have been obvious to one skilled in the art at the time of the invention to combine the teachings of Sonderman et al. with the teachings of Lin et al. to identify a missing pattern defect when determining the quality of the workpiece. The motivation for identifying a missing pattern defect would be to increase the efficiency of the manufacturing process and creating a higher yield by finding defects and possibly repairing them (Lin et al., column 1, lines 41-50).

3. Claims 8 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sonderman et al. in view of MacDougall et al. (US 6,601,411).

Sonderman et al. teaches all of the limitations of claims 8 and 24 except the limitation of measuring at least one of an implant dose and energy, and an anneal temperature and time.

MacDougall et al. teaches measuring an anneal temperature and time (column 6, lines 25-30).

It would have been obvious to one skilled in the art at the time of the invention to combine the teachings of MacDougall et al. with the teachings of Sonderman et al. to measure the anneal time and temperature when collecting process data. The motivation for making this combination would be to create the most stable grating by annealing at a certain measured temperature for a certain measured period of time (MacDougall et al., column 6, lines 25-30).

4. Claims 11, 14, 27, and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sonderman et al. in view of Mozumder et al. (US 5,661,669).

Sonderman et al. teaches all of the limitations of claims 11, 14, 27, and 30 except the limitation that the quality characteristic is based on an equation based model (current claims 11 and 27) and periodically updating the workpiece state trace data and updating the associated quality profile as the workpiece progresses through the process flow (current claims 14 and 30).

Mozumder et al. teaches an equation representing the desired quality characteristic (column 3, lines 60-65) and using model adjusting circuitry to update a value of a constant term of the model and therefore update the quality characteristic (column 5, lines 29-32).

It would have been obvious to one skilled in the art at the time of the invention to combine the teachings of Sonderman et al. with the teachings of Mozumder et al. to use an equation to find the quality characteristic. The motivation for making this combination would be to have an easy an accurate way to find the quality profile based on a few measurable parameters. Furthermore, updating the model would give a more accurate representation of how the model is currently operating (Mozumder et al., column 5, lines 34-37).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Meagan S Walling whose telephone number is (703) 308-3084. The examiner can normally be reached on Monday through Friday 8:30 AM to 5 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Barlow can be reached on (703) 308-3126. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

msw

Supervisory Patent Examiner
Technology Center 2800